PATENT SPECIFICATION

DRAWINGS ATTACHED

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926,789

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COMPLETE SPECIFICATION

Sealing Device

We, CADILLAC GAGE COMPANY, a corporation of the State of Michigan, United States of America, of 25760 Groesbeck Highway, Roseville, Michigan, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a sealing device capable of withstanding high temperatures. The invention is of particular, but by no means exclusive, use in jet aircraft and in missiles.

An object of the invention is to improve and simplify the construction and operation of a sealing device.

An advantage of the invention is to allow the areas to be sealed to contact directly against the sealed device without first providing an annular groove of predetermined depth in order to limit the height or operating length of the seal.

The invention provides a sealing device in which the user can more readily finish the surfaces against which the seal or seals are to be used because one does not have to work at the bottom of a groove.

The invention will now be described in more detail by way of example, with reference to the accompanying drawings, in which:—

Figure 1 is a central longitudinal cross section of a sealing device for internal pressure;

Figure 2 is a central longitudinal cross section of a sealing device for external pressure;

Figure 3 is a central longitudinal cross section of a sealing device for sealing against both internal and external pressures;

Figure 4 is a central longitudinal section of a flange joint illustrating the application of a sealing device as shown in Figure 1, and

Figure 5 is a perspective view of the device illustrated in Figure 2.

Referring to Figure 1, a sealing device has a major groove 10 having inclined side lip portions 11-*a* and 111-*b*, and a bottom 12 which joins the two inclined side lip portions.

On the extending ends of side lip portions 11-*a* and 11-*b* are lateral shoulders 13 having sealing surfaces 14-*a* and 14-*b*. The bottom 12 of groove 10 is an integral part of the outer solid, annular body 15 of the device which body 15 acts as a spacer, and which is sometimes called a compression length control. By compression length control is meant that body or spacer 15 limits the amount the sealing device can be compressed. The thickness of body or spacer 15 is slightly less than the distance between sealing surfaces 14-*a* and 14-*b*.

The length of side lip portions 11-*a* and 11-*b* may be varied to prevent undue strains and possible breakage. The depth of groove 10 also may be varied to provide any desired pressure area to maintain the required contact pressure between surfaces to be sealed.

Also, the thickness of the walls of lip portions 11-*a* and 11-*b* may be predetermined to meet the required stiffness, as well as flexibility, to permit the sealing surfaces properly to contact the surfaces to be sealed. Since the thickness of the walls of lip portions 11-*a* and 11-*b* can be controlled, it makes it possible to produce a sealing device having any degree of flexibility desired, and also makes it possible to utilize the device under varying pressure requirements.

In Figure 4 is shown a typical application of the sealing device of Figure 1. The surfaces sealed consist of the joint between two plates 16 and 17 which are joined by bolts such as 24. The installation of the sealing

device consists of placing it between the sealing surfaces with major grooves 10 opening toward the greater gas or liquid pressure. As bolts 24 are drawn up, sealing surfaces 14-*a* and 14-*b* initially contact plates 16 and 17. Bolts 24 are continued to be drawn tight tending to flex or spring lip portions 11-*a* and 11-*b*. This springing action increases the sealing pressures between plates 16 and 17 and sealing surfaces 14-*a* and 14-*b*. Bolts 24 continue to be drawn up until lip portions 11*a* and 11-*b* have flexed sufficiently to permit plates 16 and 17 to contact body 15, which, acting as a spacer, does not permit further tightening of bolts 24.

After the sealing device is securely in place, liquid or gas pressure may be introduced into groove 10. This pressure increases the effectiveness of the device since it acts against lip portions 11-*a* and 11-*b*, forcing them outward. This action tends to increase the sealing pressure between surfaces 14-*a* and 14-*b* against plates 16, 17. Thus an increase in pressure of the liquid or gas will result in a proportional increase in sealing pressure.

In designing the sealing device, the area in groove 10, length of side lip portions 11-*a* and 11-*b* and the proportions of the device, are carefully calculated. This is to enable the sealing device to contact the sealing surfaces with initial loading, ensuring high efficiency of the device both for vacuum and pressure operating conditions.

A sealing device designed for external pressure applications is illustrated in Figure 2, which is a reversed configuration of the device shown in Figure 1. Figure 2 shows a cross section of a device having a pressure groove located in its outer circumference. A perspective drawing of the device of Figure 2 shown in Figure 5.

As in the internal pressure sealing device, the external pressure sealing device has two extending side lip portions 19-*a* and 19-*b* which forms the sides of a groove 18. The device also incorporates a body or spacer 20 which functions in a manner similar to body or spacer 15.

Another embodiment is illustrated in Figure 3. This is a combination internal and external sealing device having a central spacer 21 and two pressure grooves 22 and 23. This device may be used in applications where it is desired to seal between two differential pressures. The device works on the same principle, but utilizes centre ring-like body 21 as the spacer.

In manufacturing these sealing devices it has been found that they may be made of various materials. For example, they may be made of cast iron, special iron alloys using nickel, or other metals having a degree of spring or flexible action. Also plastics of several types may be employed.

WHAT WE CLAIM IS:—

1. A sealing device for joining the substantially plane faces of two members and adapted to provide a leak-proof connection impervious to fluid pressure differentials between the interior and exterior of the two members. The device comprising:—

an incompressible unbroken annular spacer body presenting two substantially parallel faces for engagement with the said plane faces;

symmetrically disposed integral annular lip portions projecting at a diverging angle from the spacer body and being inclined with respect to the axis thereof;

the lip portions ending with substantially parallel annular sealing surfaces separated from each other in the free state by a distance slightly larger than the thickness of the spacer body, the annular sealing surfaces being situated in planes substantially parallel to the planes of the faces of the spacer body;

and the apex of the angle of the annular lip portions being in the direction of lesser fluid pressure;

whereby when the said two members are drawn together the lip portions are elastically bent until their sealing faces are substantially co-planar with the faces of the spacer body which limits the degree of closeness of the said two members.

2. A sealing device for uniting the substantially plane faces of two members and adapted to provide between them a leak-proof connection impervious to fluid pressure differentials between the inclosure formed by the members and the ambient, the device comprising:—

an incompressible unbroken annular spacer body presenting two substantially parallel faces for engagement with the faces of the two members;

symmetrically disposed, integral, substantially flexible, thin, annular, lip portions projecting radially at a diverging angle from the spacer body and forming a pair of conical surfaces converging toward the spacer body so that an imaginary plane bisecting the diverging angle cuts the spacer body at substantially equal distances from its two faces;

the lip portions ending with substantialy parallel annular sealing surfaces separated from each other in the free state by a distance slightly larger than the thickness of the spacer body, the annular sealing surfaces being situated in planes substantially parallel to the planes of the faces of the spacer body and substantially equally spaced from the said planes to cause the annular sealing surfaces to engage the faces of the two members and be resiliently urged in contact with them when they are drawn together until separated by the thickness of the spacer body;

and the angle of the lip portions opening towards the fluid of greater pressure to cause

the annular sealing surfaces to increase the force with which they are urged in contact with the faces of the two members proportionally to the pressure of the fluid.

3. A sealing device according to Claim 1 or Claim 2, wherein the lip portions project inwardly of the spacer body.

4. A sealing device according to Claim 1 or Claim 2, wherein the lip portions project outwardly of the spacer body.

5. A sealing device according to Claim 1 or Claim 2, wherein the lip portions project both inwardly and outwardly of the annular spacer element.

6. Sealing devices substantially as herein described with reference to the accompanying drawing.

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926789 COMPLETE SPECIFICATION
1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

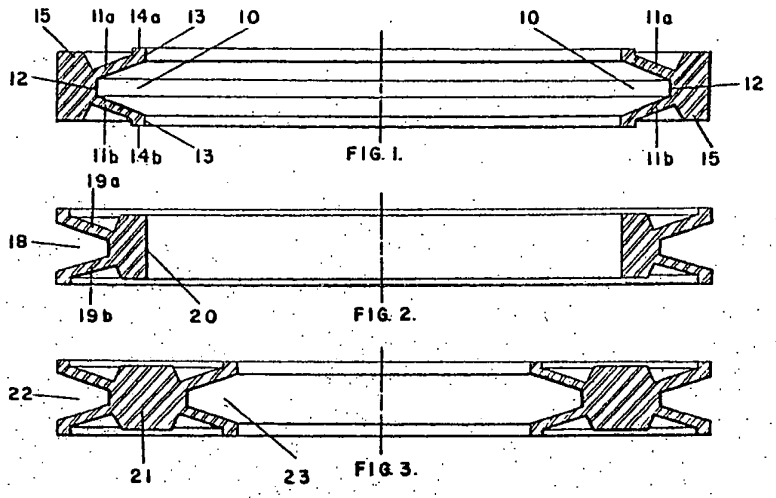

FIG. 1.

FIG. 2.

FIG. 3.

FIG. 4.

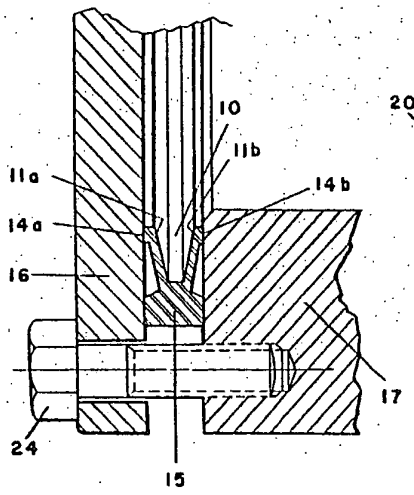

FIG. 5.